open; there has always been a possibility of vision along the collimating axis prolonged. Lines of sphinxes have been broken to ensure this; at Medinet Abou, on the opposite side of the river to Karnak, we have outside this great temple a model of a Syrian fort. If we prolong the line of the temple from the middle of the Naos through the systems of pylons, we find that in the model of the fort an opening was left, so that the vision from the Sanctuary of the temple was left absolutely free to command the horizon.

It may be said that that cannot be true of Karnak, because we see on the general plan that one of the temples, with an azimuth of 71° N., had its collimating axis blocked by numerous buildings. That is true; but when one comes to examine into the date of these buildings, it is found that they are all very late; whereas there is evidence that the temple was one of the first, if not the very first, of the temples built at Thebes.

Mariette spent a long time in examining the temple of Karnak. His idea is that the part of the temple near the Sanctuary represents the first part of the building; and at that time the great temple of Karnak—enormous though it is now—was so small and entirely out of the way of the line of the axis of the temple of Maut that its existence might have been entirely neglected. There was first a square court like the court of the Tabernacle, and very shortly after that a very laboured system of pylons was introduced to restrict the light. The next stage shows the Sanctuary thrown back away from the court; then, after that, more complication is introduced by the addition of pylons, until finally, after two or three extensions, the length of the temple was quadrupled. So that the proof is positive that at first the horizon of the temple of Maut was left perfectly clear. Why it was subsequently blocked I shall suggest afterwards.

The next point to be noticed is that there is in very many cases a rectangular arrangement, so that if the sun were observed in one temple and a star in the other, there would be a difference of 90° between the position of the sun and the position of the star at that moment. This would, of course, apply also to two stars. Sometimes this rectangular arrangement is in the same temple, as at Karnak, sometimes in an adjacent one, as at Denderah.

If we look at Denderah we find that we have there a large temple inclosed in a square *temenos* wall, the sides of which are parallel to the sides of the temple; and also a little temple at right angles to the principal one.

It is hardly fair to say that a rectangular arrangement, repeated in different localities, is accidental; it is one which is used to some extent in our modern observatories.

The perpetual recurrence of these rectangular temples shows, I think, that in all the pairs of temples which are thus represented, there was some definite view in the minds of those who built them.

Another point is that, when we get some temples pointing a certain number of degrees south of east, we get other temples pointing the same number of degrees south of west, so that some temples may have been used to observe risings and others settings of stars in the same declination. It is then natural of course to conclude that these temples were arranged to observe the rising and setting of the same stars.

J. NORMAN LOCKYER.

(*To be continued.*)

BOTANICAL ENTERPRISE IN THE WEST INDIES.

WE have several times had occasion to mention the mission of Mr. D. Morris, the Assistant Director of the Royal Gardens, Kew, to the West Indies, in connection with the extension and organization of botanical stations in the British colonies of that region; and the *Kew Bulletin* for May and June, as we have already noted, contains his report thereon. It is a lengthy and interesting document, from which we propose to extract some particulars that may be welcome to our readers, and serve to put on record the reviving enterprise in the development of the natural resources of that part of the Empire. The primary object of Mr. Morris's visit was to settle the practical details of a scheme for establishing and administering a number of smaller botanical gardens in connection with the larger gardens of Trinidad and Jamaica. The main purpose of these gardens is to raise plants of economic value, suitable for cultivation in the various islands, "and to do all that is possible to encourage a diversified system of cultural industries, and thus relieve the planters from the results inevitable from the fluctuations of prices in the one or two staples to which they have hitherto confined their attention"; but they will also be made, as far as possible, pleasant places of public resort. Mr. Morris met with a hearty reception everywhere, and great interest was manifested in the work by the negro freeholders, in some of the islands, as well as the English colonists. The men in charge of these experimental stations, as they may be called, rather than botanical gardens, are mostly trained men from Kew; and Kew is the centre from which plants and seeds of economic plants likely to succeed in the West Indies are distributed. Mr. Morris left Kew in November last, and returned home at the end of February. Advantage was taken of his outward journey to send by the same ship, under his immediate supervision, a number of Wardian cases filled with Gambier plants. Gambier, it may be added, is the name of a substance used in tanning, obtained from *Uncaria Gambier*, Roxb.; and the plants had been raised at Kew from seeds received from the Straits Settlements, several attempts to introduce plants from the East having failed. How the plants were successfully carried to the West Indies we learn from the following passage in the report:—

"Owing to the cold weather, the cases containing the plants on board the *Atrato* were placed below in the main saloon. There was very little direct light in the daytime, but the question of warmth was for the moment of more importance than that of light. It was also hoped that they could be placed on deck in a day or two at the most. The weather during the whole of the first week, however, continued very cold, and it was impossible to expose the plants on deck. Under these circumstances it was fortunate that the electric light, with which every part of the ship was supplied, was available to try an experiment of some interest. Although the plants received very little light during the day, they had a good supply of the electric light during the night, and the plants in the cases more fully exposed to the electric light were afterwards found to be in a much better condition than the others. It is well known that plants will thrive under the influence of artificial light, but in this instance there was so little direct light available during the day, that the plants had to depend almost entirely on the light they received at night. The Gambier plants are particularly sensitive as regards a diminution of light. During the prevalence of fogs at Kew they have been known to drop their leaves within a day or two, and to remain bare during the rest of the winter. This may have been, in some measure, also due to the injurious influence of the fog itself.

"The use of electric light for the safe transit of such valuable plants as are obliged to be despatched from this country during the winter months is evidently capable of being greatly extended. It may also be utilized in the case of tropical plants arriving in this country from abroad, during the prevalence of cold weather. Such plants could be placed below directly the weather is

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becoming too cold for them on deck, and then the more electric light they have the better."

Out of the whole consignment to the various islands only ten plants succumbed; but this was due to an oversight in carrying the case on to Trinidad and La Guayra, and having to bring it back again to St. Vincent, thereby causing a delay in landing of ten days.

Mr. Morris visited successively Antigua, Dominica, Montserrat, St. Kitts, Anguilla, Tortola, Santa Lucia, St. Vincent, Grenada, Barbados, and Jamaica, being present at the opening of the Exhibition at the last-named island. Everywhere the Governors and other officials seem to have done their utmost, both personally and indirectly, to assist Mr. Morris in fulfilling the object of his mission. Established gardens were inspected, sites for new gardens selected, means discussed, and addresses delivered, from which it is confidently hoped that substantial advantages to the cultural industries may accrue.

Mr. Morris's Report, which may be obtained for the sum of fourpence, is a valuable and interesting account of the present condition and future prospects of planting in the various islands, and should be in the hands of all concerned. We conclude this notice with an extract from a description of the lime plantations in Montserrat, "where the immense golden heaps of ripe fruit were alone worth a journey to the West Indies."

"The West Indian lime (*Citrus medica*, var. *acida*) appears to be a thin-skinned local variety, little known outside the West India Islands. It yields juice of a singularly pure acid flavour, and it deserves to be much better known in this country in the fresh state for making 'lemon' beverages, as well as for general use in cookery. The enterprise of the Montserrat Company extends to other things besides limes. Nevertheless, from limes alone it is possible to produce a variety of articles more or less valuable. The limes themselves are exported as gathered, or they are preserved in salt water, and shipped in a pickled state for consumption in certain parts of the United States. Lime-juice, obtained by compression, is exported either raw or in a concentrated state. This latter is obtained by evaporating the raw juice in boilers until it is reduced to about one-twelfth of the original bulk, when it is ready for export as a dark, viscid substance like molasses. This is used for the preparation of commercial citric acid. From the rind of the fruit, by a process known as 'ecuelling,' which consists of gently rubbing the fruit on rounded projections arranged inside a brass basin, a very fine essence of limes is obtained. Again, by distilling the raw lime-juice a spirit is obtained known as oil of limes."

NOTES.

The deputation which is to submit to Sir Michael Hicks Beach to-morrow a statement of the facts relating to the proposed British Institute of Preventive Medicine, will be large, influential, and thoroughly representative of the various departments of science. It is expected that the following gentlemen will speak: Sir Joseph Lister, the Duke of Westminster, Sir Henry Roscoe, Prof. Dewar, Mr. Haldane, M.P., Q.C., and Prof. Ray Lankester. A letter from Prof. Huxley will be read.

The list of those selected for Birthday Honours includes Dr. Archibald Geikie, on whom the honour of knighthood has been conferred, and Mr. Robert Giffen, who has been made C.B.

In the course of an investigation, part of which has already been communicated to the Royal Society, Prof. Roberts-Austen has discovered the most brilliantly coloured alloy as yet known. It has a rich purple colour, and bright ruby tints are obtained when light is reflected from one surface of the alloy to another. It contains about 78 per cent. of gold, the rest of the alloy being aluminium. The constants of the aluminium-gold series of alloys are now being examined, and will shortly be published.

On Tuesday last, at Oxford, Convocation sanctioned the expenditure of very considerable sums of money in order to provide increased accommodation for the medical and science schools. The Lecturer in Human Anatomy, Mr. Arthur Thomson, estimated that the immediate wants of his department necessitated the expenditure of £7000. With this sum might be provided a laboratory, which would include dissecting-rooms, a museum, working rooms, and a lecture theatre. Hitherto the accommodation provided for the lecturer has been of a temporary character, and has now proved itself utterly inadequate for the requirements of his class. The number of students now studying in Oxford with the intention of passing the M.B. examination is 67. As illustrating the growth of the class, and the interest taken in this school, it may be mentioned that in 1885 the lecturer's class consisted of only three members. The Deputy Professor of Physiology (Dr. Ray Lankester) required the more modest sum of £2000 in order to supply the deficiencies in the department of Morphology. With this sum two laboratories could be provided, one 40 × 20 feet, and the other 30 × 20 feet. Meanwhile the departments of Ethnology and Geology find themselves cramped for space at the University Museum, and Convocation has granted the sum of £1300 to provide rooms for the use of the Curator and the servants of the Museum, and increased accommodation for teaching. The Hope Professor of Zoology (Prof. Westwood) needed only the expenditure of £350 upon additions and improvements in his department at the University Museum. The expenditure of these various sums, amounting in the aggregate to nearly £11,000, will place the School of Medicine and the related sciences in a satisfactory position, and the University of Oxford is to be congratulated on its appreciation of the importance of these departments, and the liberality with which it maintains them.

The Gold Medal of the Linnean Society has this year been awarded to Dr. Edouard Bornet, of Paris, for distinguished researches in botany. His earliest publications related to the structure and life-history of Fungi and Lichens, but his name is best known for the important researches in which, with his friend M. Thuret, he has been for some years engaged, on the life-histories of Algæ, and for his valuable contributions on this subject in the "Études Phycologiques," and the "Notes Algologiques," with their beautiful illustrations.

At a meeting of the Ashmolean Society, Oxford, on June 1, there was an interesting discussion on a paper, by Mr. Romanes, on Weismann's theories of heredity, in which Prof. Lankester and Mr. Poulton took prominent parts.

M. Douliot, Demonstrator in Botany at the Museum of Natural History, Paris, has undertaken a scientific expedition to Madagascar.

Mr. Norman Lockyer, F.R.S., has undertaken to give a lecture at Bedford College (for Ladies), Baker Street, on Wednesday next, at o'clock, "On Natural Philosophy for Artists."

We regret to have to record the death of Sir John Hawkshaw, F.R.S. He died on Tuesday last at his town residence, Belgrave Mansions, in his 81st year. The greatest of his many engineering feats was the construction of the Severn Tunnel. He was President of the Institution of Civil Engineers in 1862-63, and of the British Association at its Bristol meeting in 1875. He received the honour of knighthood in 1873.

Seven years have elapsed since the first International Ornithological Congress took place in Vienna, under the presidency of the late Crown Prince Rudolph. England was on that occasion, as a correspondent wrote at the time, "conspicuous by her absence," and at the second Congress, which has just been held

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